

THE MINERAL INDUSTRY OF

ZIMBABWE

By Philip M. Mobbs

Zimbabwe's economy was ravaged by problems, including the devalued Zimbabwe dollar, commercial lending rates exceeding 40%, inflation exceeding 30%, hikes in power (a 67% fuel price increase and a 33% electricity price increase) and transportation costs, and a high unemployment rate (Jensen, 1999; Farai Makotsi and Nqobile Nathi, *Financial Gazette*, August 7, 1998, Siege mentality in corridors of power as nation teeters on brink of economic turmoil, accessed August 8, 1998, at URL

<http://www.africaonline.co.zw/fingaz/stage/archive/980808/national22114.html>). In April, the second phase of the Zimbabwe Programme for Economic and Social Transformation (ZIMPREST) was inaugurated. ZIMPREST was proposed to encourage economic growth and restructure Government; however, in 1998, the national gross domestic product (GDP) fell to \$6.5 billion,¹ down from the \$8.2 billion posted in 1997 (World Bank, September 9, 1999, Zimbabwe at a glance, accessed November 26, 1999, at URL <http://www.worldbank.org/data/countrydata/countrydata.html>). The devaluation of the Zimbabwe dollar manifested itself in increased costs of imports, including electric power, mineral fuels, and mining equipment and supplies.

Zimbabwe was a major contributor to the world supply of chrysotile asbestos, ferrochromium, and lithium minerals. Gold was the country's leading income-producing mineral. Gold production increased slightly to 25 metric tons (t), despite the closure of several large mines. Most of the country's mineral companies were export oriented and subject to world market fluctuations. Despite extensive diversification in 1998, the mineral industry again was battered by declining international prices for precious metals, higher labor and power costs, prohibitive interest rates, and spiraling inflation. Zimbabwe's mining companies continued to follow survival strategies. Mineral operations were scaling down to cut costs and to attempt to remain economically viable.

Structure of the Mineral Industry

All mining activities come under the Mines and Minerals Act (Chapter 165) (1961), its amendments, and associated regulations. The Ministry of Mining, Environment, and Tourism is responsible for the mining sector. All mineral rights are vested in the state through the President of Zimbabwe. Investment projects are sanctioned by the Zimbabwe Investment Center. The Gold Trade Act gives the

¹Where necessary, values have been converted from Zimbabwe dollars (Z\$) to U.S. dollars at the average exchange rate of Z\$23.5=US\$1.00 in 1998 and Z\$12=US\$1.00 in 1997.

Reserve Bank of Zimbabwe a monopoly on purchasing and exporting all gold produced in Zimbabwe. The Government's Minerals Marketing Corp. Zimbabwe handles most other mineral exports.

The state-owned mining company, Zimbabwe Mining Development Corp. (ZMDC) had an interest in a number of mining operations, and the Government's Industrial Development Corp. of Zimbabwe Ltd. had several subsidiary companies operating in the industrial mineral sector.

Zimbabwe had a significant local mining industry. More than 500 gold mining operations were registered. Production from the large mines of Ashanti Goldfields Co. Ltd. of Ghana, Kinross Gold Corp. of Canada, Lonrho Zimbabwe Ltd., and Rio Tinto Zimbabwe Ltd. dominated the gold sector, and the numerous medium- and small-scale producers contributed about 10% to the nation's formal gold production. Alluvial gold panning was Zimbabwe's rural alternative to subsistence farming. The Mining (Alluvial Gold) (Public Streams) Regulations (1991) authorize selective alluvial gold mining, but extensive riverbank erosion and stream siltation resulted from uncontrolled mining activity.

Commodity Review

Despite the difficulties permeating the mineral industry, a number of mining companies continued exploration in Zimbabwe, primarily for diamond or gold. These including Ashanti Goldfields Zimbabwe (Pvt.) Ltd.; Barrock Mine (Pvt.) Ltd., a subsidiary of Mandorin Goldfields Inc. of Canada; Boulder Mining Co. (Pvt.) Ltd.; Casmyn Mining Zimbabwe (Pvt.) Ltd.; and the joint venture of Cambrian Resources of Australia and Prospecting Ventures Ltd., a subsidiary of Anglo American Corp. of South Africa Ltd. (AAC). Also active were Consolidated African Mining Corp. of the United Kingdom; the joint venture of Falconbridge Exploration Zimbabwe (Pty.) Ltd., a subsidiary of Falconbridge Ltd. of Canada, and NAR Resources Ltd. of Canada; Kimberlitic Searches Ltd.; the joint venture of Rio Amarillo Mining Ltd. of Canada, Mandorin Goldfields, and Picard Holdings Ltd.; and the joint venture of Trillion Zimbabwe (Pvt) Ltd., a subsidiary of Trillion Resources Ltd. of Canada; Nickelodeon Minerals Inc. of Canada; Skeena Resources Ltd of Canada; and Cratonic Zimbabwe Resources (Pvt.) Ltd., a subsidiary of Delta Gold NL of Australia. Catalyst Ventures Corp. of Canada was divesting its gold exploration properties, and Rift Resources Ltd. of Canada wrote off its exploration joint venture with Reunion Mining PLC of the United Kingdom.

Metals

Copper.—Despite mounting fiscal problems, Mhangura Copper Mines Ltd. continued its \$10 million rehabilitation program. The Government paid off a \$13 million delinquent loan it previously had guaranteed for Mhangura.

Gold.—Ashanti produced a record 3,368 kilograms (kg) of gold at the Freda Rebecca Mine in 1998 from 1.11 million metric tons of ore. Ore production from the depleted Freda open pit ended in February after which all ore production was from underground (Ashanti Goldfields Co. Ltd, January 27, 1999, Ashanti announces strong production and cost reductions for 1998, accessed May 19, 1999, at URL <http://www.ashanti.co.gh/pressreleases/current/seann170.htm>). Battlefield Minerals Corp. of Canada was building a carbon-in-pulp treatment plant at the Pickstone-Peerless gold mine. Casmyn Corp. of the United States added a fourth production circuit at the open pit Turk Mine, increasing output capacity to 650 kilograms per year (kg/yr) of gold, and began ore production from the Queens Group of mines (Casmyn Corporation, August 26, 1998, Casmyn Corp. announces third quarter results, accessed August 27, 1998, at URL http://biz.yahoo.com/prnews/980826/nv_casmyn_1.html).

Falcon Gold Zimbabwe Ltd. (Falgold), a subsidiary of Falcon Investments S.A. of Luxembourg, closed the Dalny and the Venice Mines in 1998 and continued operations at the Golden Quarry Mine. Bayham Mining Ltd. of Zimbabwe acquired the option to buy the assets of Falgold's closed mines. At the Blanket Mine, Kinross Gold produced 1,097 kg of gold (Kinross Gold Corp., January 26, 1999, press release, accessed July 16, 1999, at URL <http://www2.cdn-news.com/scripts/ccn-release.pl?1999/01/26/k990126>). Lonrho's subsidiaries, Independence Mining (Pvt.) Ltd. and Corsyn Consolidated Mines (Pvt.) Ltd., continued to restructure the group's mining activities. Independence Mining successfully completed a 9-month, \$1.3 million clean up of the Umzingwane River after the February 1998 slimes dam breach.

Kwe Kwe Consolidated Gold Mines Ltd., a subsidiary of Delta Gold Zimbabwe (Pvt.) Ltd., commissioned the Chaka gold mine near Kwekwe. Trial mining at Chaka had resulted in the production of 70 kg of gold during the last quarter of 1998. In August 1998, Delta Gold began construction of a \$23 million mine on the Eureka prospect, near Guruve. The proposed 2,000-kg/yr-capacity Eureka gold mine was expected to be on-stream in 1999 (Delta Gold Zimbabwe (Pvt.) Ltd., 1998).

Sabi Gold Mines Ltd., a subsidiary of ZMDC, was continuing its \$4 million expansion program at the Sabi Mine. Trillion Resources proposed to expand the production capacity of the Ndarama gold mine to 900 kg/yr (Trillion Resources Ltd., 1998).

Nickel.—The \$1.1 million shaft-deepening program continued at Bindura Nickel Corp. Ltd.'s Trojan Mine; however, declining nickel prices, poor ground conditions, and difficult ore mineralogy resulted in the closure of the Bindura's Epoch Mine in September. Environmental remediation of the

mine site was underway. Bindura also temporarily shelved plans to open the proposed Hunter's Road Mine.

Bindura Smelting & Refinery Ltd. produced 8,732 t of nickel from ore from its mines in Zimbabwe. In 1998, toll refined nickel reached 10,579 t. RTZ's Empress Refinery produced 6,430 t of toll-refined nickel and Bindura toll refined 4,149 t of nickel, as toll-refined nickel exceeded nickel production from locally sourced concentrates (Bindura Nickel Corp. Ltd, 1999; TEX Report, 1999). Nickel matte imported from Botswana for toll refining at Bindura and RTZ was augmented by nickel concentrates imported from Australia.

Platinum.—Delta Gold spun off its platinum interests in Zimbabwe to Zimbabwe Platinum Mines Ltd. (Zimplats). Delta Gold retained 51% equity interest in Zimplats and assigned the remaining 49% interest to Delta Gold shareholders. Technical problems continued to plague operations at the Hartley platinum complex of BHP Minerals Zimbabwe, a subsidiary of Broken Hill Proprietary Co. Ltd. of Australia, and Zimplats. An open pit mine was opened to supplement less-than-expected underground ore production, and the newly opened smelter was closed for 2 months for modifications (Africa Energy & Mining, 1998; Johnson Matthey, 1999, p. 19).

Anglo American Corp. completed a feasibility study on the Unki prospect near Shurugwi in March and continued negotiating tax concessions and expatriate work permits with the Government for the proposed \$60 million Unki platinum mine (Stanley Gain, Herald, January 17, 1999, Bureaucracy delays billion-dollar platinum project, accessed January 25, 1999, at URL <http://www.zimsurf.co.zw/theherald/jan99/17/beau.html>). In October 1998, the feasibility study of Zimplats' 100%-owned Ngezi platinum prospect was expanded to include the option of developing the prospect with an open pit mine.

Steel.—The reconstruction of Zimbabwe Iron and Steel Co. (Pvt.) Ltd.'s (Zisco) No. 4 blast furnace by China's Shougang International continued during 1998. Ferrostaal AG of Germany was rehabilitating Zisco's continuous casting facility. As part of the modernization program, Ferrostaal installed a dedusting system, worked on a water-treatment plant, and installed a basic oxygen furnace converter vessel.

Uranium.—In September, Minroc Mines Inc. of Canada acquired a 50% interest in the Kanyemba uranium-vanadium prospect from Cline Mining Corp. of Canada.

Industrial Minerals

Asbestos.—In May, African Associated Mines (Pvt.) Ltd. proposed a \$3 million mine and plant modernization. The Asian economic crisis had adversely affected its primary asbestos markets, although in 1998, new marketing agreements were signed with Iranian, Japanese, and South African distributors. The company finished the year fighting a proposed ban on the commercial use of chrysotile asbestos in the European Union and the United Kingdom.

Cement.—Portland Holdings Ltd. commissioned the \$30

million Colleen Bawn cement kiln in August, but startup problems effectively reduced the cement production (Financial Gazette, November 26, 1998, Shortage of cement hits construction sector hard, accessed November 30, 1998, at URL <http://www.africaonline.co.zw/fingaz/99/stage/archive/981126/companies2157.html>).

Diamond.—In February 1998, River Ranch (Pvt.) Ltd., the operating company of the River Ranch Diamond Mine, Zimbabwe's only formal diamond mine, closed the mine because of low international diamond prices. In November, Buby Minerals (Pvt.) Ltd. of Zimbabwe was appointed by the liquidators to rehabilitate the mine equipment and process the diamond dump at the mine. Evaluation of the bids from five companies for the mine's assets were being evaluated by the receivers at yearend.

Mineral Fuels

Coal.—Wankie Colliery Co. (Pvt.) Ltd. was developing the \$167 million M-block Mine. The proposed 600,000-metric-ton-per-year-capacity underground mine will supplant coal output produced by Wankie's No. 3 Mine in 1998 (Mining Journal, 1998).

Petroleum.—In 1998, the continued financial problems of the state-owned fuel distribution company, National Oil Co. of Zimbabwe, resulted in several fuel shortages. The Ministry of Transport and Energy was evaluating the construction of an oil refinery in Zimbabwe to reduce the country's dependence of imported refined petroleum products. The country's old oil refinery, the Feruka, near Mutare, had been converted into a petroleum storage depot in 1981.

Infrastructure

Most of landlocked Zimbabwe's bulk commodities were moved by rail. National Railways of Zimbabwe (NRZ) announced a freight fare increase of 25% to 30% on all commodities in July (Zimbabwe Business News Headlines, July 27, 1998, item no. 14, accessed on July 28, 1998, at URL <http://www.bizafrica.com/zimbabwe/opport/daily.html>). All major cities and industrial centers were linked to Botswana, Mozambique, South Africa, and Zambia by the NRZ. Petroleum products were piped through Mozambique via the Beira pipeline to Feruka and then moved west via the Mutare-Harare pipeline or trucked on Zimbabwe's 85,784-km road network. Additional petroleum products were imported via railroad tanker cars through South Africa.

Outlook

Asbestos, coal, ferroalloys, gold, and nickel are expected to remain the mainstays of the Zimbabwean mineral economy, with the significance of granite and platinum-group-metals production expected to increase. The continued high cost of domestic capital, potential negative international perception of governmental actions, and costs associated with the widespread

Human Immuno-Deficiency Virus/Acquired Immune Deficiency syndrome (HIV/AIDS) infection of the workforce (estimated to be 25% of the urban labor pool) could be detrimental to the industry (Nqobile Nyathi, September 3, 1998, AIDS forces companies to dig deeper into coffers, Financial

Gazette, accessed September 4, 1998, at URL <http://www.africaonline.co.zw/fingaz/stage/archive/980903/companies7995.html>). The investment regulations, the nation's well-developed and well-maintained infrastructure, new exploration techniques, and accessible mineral resources, however, were expected to encourage further local and foreign participation in the mineral industry.

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Major Sources of Information

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TABLE 1
ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998	
METALS						
Antimony, mine output, concentrate, Sb content	65	37	5	-- r/	--	
Chromite, gross weight	thousand tons	517	707	697	670 e/	605
Cobalt, metal 2/		126	109	106 r/ 3/	126 r/	137
Columbium and tantalum, tantalite concentrate, gross weight e/		7 3/	1	--	--	--
Copper:						
Mine output, concentrate, Cu content e/	thousand tons	9	9	10	9	4
Metal:						
Smelter output, blister/anode, primary e/		10,000	8,000	7,600	4,000	3,000
Refinery output, refined/cathode, primary		9,350	6,875	10,900	4,993 r/	2,941
Gold	kilograms	20,512	23,959	24,699	24,156 r/	25,175
Iron and steel:						
Mine output, iron ore:						
Gross weight	thousand tons	4	311	324	479	372
Fe content e/	do.	3	160	160	240	190
Metal:						
Pig iron e/	do.	100	209 3/	210	216 r/	230
Steel, crude	do.	187	210	212	214 r/	220
Ferroalloys:						
Ferrochromium	do.	183	254	243	233 r/	247
Ferrosilicon chromium	do.	36	47	33	17 r/	21
Nickel:						
Mine output, concentrate, Ni content		13,836	11,721	11,561	12,963 r/	12,872
Refinery output, refined metal		13,516	10,864	9,694	10,300 r/ 4/	8,732
Platinum-group metals:						
Palladium	kilograms	17	17 e/	120 e/	245 r/	1,855
Platinum	do.	7	7 e/	100 e/	345 r/	2,730
Rhodium	do.	-- e/	-- e/	-- e/	27	177
Selenium e/	do.	2,009	2,000 e/	2,000 e/	1,000 r/	500
Silver	do.	10,942	15,640	9,982	5,923	6,681
Tin:						
Mine output, Sn content e/		100	10	10	10	1
Smelter output, metal		82	--	--	--	--
INDUSTRIAL MINERALS						
Asbestos	thousand tons	152	169	165	145	123
Barite		--	--	-- e/	1,217 r/	1,844
Cement, hydraulic e/	thousand tons	1,070	968 r/	1,000 r/	1,100 r/	1,100
Clays:						
Bentonite (montmorillonite)		169,097	169,823	185,953	186,000 e/	135,785
Kaolin		462	57	-- e/	-- e/	-- e/
Other clays 5/		13,997	12,743	14,479	14,000 e/	2,818
Diamond	carats	173,588	204,416	437,266	421,307	28,732
Emerald	kilograms	276	2,209	1,080	1,000 e/	19
Feldspar		1,617	3,920	3,248	2,254 r/	2,241
Graphite		7,890	11,381	7,691	12,779	13,806
Kyanite		567	875	141	1,113 r/	3,780
Lithium minerals, gross weight		25,279	33,498	30,929	49,833	28,055
Magnesite		1,588	5,597	10,659	13,050 r/	4,321
Mica		213	1,040	1,500	30 r/	1,309
Nitrogen, N content of ammonia e/		70,000	42,600 r/	61,400 r/	63,700 r/	56,500
Phosphate rock, marketable concentrate	thousand tons	151	154	123	94 r/	91
Pigments, iron oxide		438	400	400 e/	-- r/ e/	--
Stone, sand and gravel:						
Granite		106,605	121,685	109,268	109,903 r/	125,576
Limestone	thousand tons	1,658	1,499	1,425	1,027 r/	1,473
Quartz 6/	do.	131	172	96	52 r/	10
Sulfur						
Pyrite:						
Gross weight		71,026	70,706	59,831	48,101	52,908
S content e/		31,000	31,000	26,000	26,000 r/	28,000
Byproduct acid, metallurgical and coal process gas e/		4,500	4,500	5,000	5,000	2,500
Talc		2,049	2,080	1,076	1,023 r/	1,039
Vermiculite		8,184	13,742	10,249	14,841 r/	14,804

See footnotes at end of table.

TABLE 1--Continued
 ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous	5,515	5,538	5,175	4,750 r/	4,575
Coke, metallurgical e/	550	300	600	600	600

e/ Estimated. r/ Revised.

1/ Table includes data available through January 1, 2000.

2/ "Metal" includes metal content of compounds/salts and may include cobalt recovered from nickel-copper matte imported for toll refining.

3/ Reported figure.

4/ Excludes toll-refined nickel.

5/ Includes fire clay.

6/ Includes rough and ground quartz, as well as silica sand.

TABLE 2
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Asbestos		African Associated Mines (Pvt.) Ltd. [SMM Holdings (Pvt.) Ltd., 100%]	Shabanie Mine, Zvishavane; Gaths and King Mines, Mashava	300
Chromite, gross weight		Zimbabwe Mining and Smelting Co. (Pvt.) Ltd. (Zimasco) (Zimasco Consolidated Enterprises, 100%)	Peak Mine and Railway Block Mine at Shurugwi and mines at Mutorshanga and Lalapanzi	500
Do.		Zimbabwe Alloys Ltd. (Zimalloys) (Anglo American Corp. of South Africa Ltd., 100%)	Great Dyke Mine, Mutoroshanga; Netherburn Mine at Lalapanzi; and Inyala Mine at Mberengwa	50
Do.		Local cooperatives	North Dyke	50
Coal		Wankie Colliery Co. (Pvt.) Ltd. (private investors, 60%; Government, 40%)	Hwange	5,500
Cobalt	tons	Bindura Nickel Corp. Ltd. (Anglo American Corp. of South Africa Ltd., 65%; Government, 20%)	Shangani Mine, northwest of Shangani; Madziwa Mine, 50 kilometers northeast of Bindura; Trojan Mine, Bindura; Epoch Mine, Filabusi 1/	150
Copper		Mhangura Copper Mines Ltd. (Zimbabwe Mining Development Corp., 55%)	Mhangura	16
Do.		Munyati Mining Ltd. Co. (Reunion Mining PLC, 75%; Zimbabwe Mining Development Corp., 25%)	Sanyati Mine, Sanyati	5
Do.		Bindura Smelter & Refinery Ltd. (Bindura Nickel Corp. Ltd., 100%)	Solvent extraction-electrowinning plant at Bindura	2 2/
Do.		Rio Tinto Zimbabwe Ltd.	Solvent extraction-electrowinning plant at Eiffel Flats	6
Do.		Lomagundi Smelting & Mining (Pvt.) Ltd. (Merits Ltd., 100%)	Smelter at Alaska	35
Do.		do.	Refinery at Alaska	28
Diamond	carats	Auridam Zimbabwe (Pvt.) Ltd. (Auridam Consolidated NL, 50%; Redaurum Red Lake Mines Ltd., 50%)	River Ranch Mine, near Beitbridge 1/	440,000
Gold	kilograms	Independence Mining (Pvt.) Ltd. (Lonhro PLC, 100%)	How Mine, Bulawayo; Tiger Reef Mine, Kwekwe; Redwing Mine, Penhalonga; Shamva Mine, Shamva; Legion dump, Kezi	3,000
Do.	do.	Ashanti Goldfields Zimbabwe (Pvt.) Ltd. (Ashanti Goldfields Co. Ltd., 82.4%, private investors, 17.6%)	Freda Rebecca Mine, Bindura	3,300
Do.	do.	Rio Tinto Zimbabwe Ltd. (RTZ Corp. PLC, 56%)	Renco Mine, 75 kilometers southeast of Masvingo; Patchway Mine, Kadoma; and Cam and Motor dump, Kadoma	2,800
Do.	do.	Falcon Gold Zimbabwe Ltd. (Falcon Investments S.A., 71.7%)	Dalny Mine, Chegutu; 1/ Venice Mine, Kadoma; 1/ Golden Quarry Mine, Shurugwi; Old Nic Mine, Bulawayo 1/	2,000
Do.	do.	Corsyn Consolidated Mines (Pvt.) Ltd. (Lonrho PLC, 100%)	Anzac Mine, Kwekwe; Arcturus Mine, Arcturus; Mazowe Mine, Mazowe; Muriel Mine, Mutorashanga	1,700
Do.	do.	Kinross Gold Corp.	Blanket Mine	1,100
Do.	do.	Zimbabwe Mining Development Corp. (Government, 100%)	Lexington Mine and Elvington Gold Mine, near Chegutu	1,000
Do.	do.	Anglo American Zimbabwe (Anglo American Corp. of South Africa Ltd.)	Bubi Mine	900
Do.	do.	Connemara joint venture (First Quantum Minerals Ltd., 95%; Chase Minerals (Pvt.), 5%)	Connemara Mine, north of Gweru	600
Do.	do.	Casmyn Mining Zimbabwe (Pvt.) Ltd.	Turk Mine, north of Bulawayo; Queens group of mines	650
Do.	do.	Jena Mines (Pvt.) Ltd. [Zimbabwe Mining Development Corp., 50%; Trillion Resources (Pvt.) Ltd. Zimbabwe, 50%]	Jena Group, Kwekwe area	400
Iron and steel:				
Crude steel		Zimbabwe Iron and Steel Co. (Pvt.) Ltd. (Government, 89%)	Redcliff, near Gweru	240 3/
Iron ore, gross weight		Buchwa Iron Mining Co. [Zimbabwe Iron and Steel Co. (Pvt.) Ltd., 100%]	Buchwa West Mine, Buchwa; Ripple Creek Mine, near Redcliff	1,400
Ferrous alloys:				
Ferrous chromium, high-carbon		Zimbabwe Mining and Smelting Co. (Pvt.) Ltd. (Zimasco) (Zimasco Consolidated Enterprises, 73%)	Smelter at Kwekwe	220
Ferrous chromium, low-carbon		Zimbabwe Alloys Ltd. (Zimalloys) (Anglo American Corp., 100%)	Smelter at Gweru	40
Ferrous chromium-silicon		do.	do.	55

See footnotes at end of table.

TABLE 2--Continued
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Lithium	Bikita Minerals (Pvt.) Ltd. (private, 100%)	Bikita Mine, 60 kilometers east of Masvingo	33
Nickel	Trojan Nickel Mines Ltd. (Bindura Nickel Corp. Ltd., 100%)	Shangani, Madziwa, Trojan, and Epoch Mines 4/	13
Do.	Bindura Smelter & Refinery Ltd. (Bindura Nickel Corp. Ltd., 100%)	Smelter and refinery at Bindura	14
Do.	Rio Tinto Zimbabwe Ltd.	Empress Nickel Refinery, Eiffel Flats, northeast of Kadoma	9
Platinum-group metals kilograms	Joint venture of BHP Minerals Zimbabwe (66.6%) and Zimbabwe Platinum Mines Ltd. (33.3%)	Hartley Mine, Selous	4,000
Do.	do. Zimbabwe Mining and Smelting Co. (Pvt.) Ltd. (Zimasco) (Zimasco Consolidated Enterprises, 100%)	Mimosa Mines, east of Zvishavane	600
Phosphate	Dorowa Minerals (Pvt.) Ltd. (Chemplex Corp. Ltd., 100%)	Dorowa Mine, 90 kilometers west of Mutare	155
Vermiculite	Shawa Vermiculite (Pvt.) Ltd. (private, 100%)	Shawa Mine, near Dorowa	39
Do.	Dinidza Vermiculite Mining Co. (Pvt.) Ltd. (private, 100%)	Dinidza Mine, near Dorowa	10

1/ Closed in 1998.

2/ Copper cathode production was suspended in 1998.

3/ Blast furnace No. 4 (capacity: 780,000 metric tons per year) was undergoing rehabilitation and remained shut in 1998.

4/ Epoch Mine was closed in September 1998.